

# Notice of Allowability

Application No.

10/510,695

Examiner

G. Nagesh Rao

Applicant(s)

FUSEGAWA ET AL.

Art Unit

1722

## -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 9/15/06.
2. ☒ The allowed claim(s) is/are 8,10,11 and 13.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☒ All b) ☐ Some\* c) ☐ None of the:
    1. ☒ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
  - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
    - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
  - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

## Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date \_\_\_\_\_
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

### EXAMINER'S AMENDMENT

1) An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Jori Krischke on 9/29/06.

The application has been amended as follows:

#### IN THE CLAIMS:

Please amend the following in claim 8:

Claim 8 Lines 15 and 16 replace with the following: --higher compared to ~~than~~ a temperature used for bringing the seed crystal into contact with the silicon melt in a method of manufacturing a silicon single crystal ~~using~~ in Dash Necking method,--

Please delete claims 14-16.

### REASONS for ALLOWANCE

2) The following is an examiner's statement of reasons for allowance:

Iino (US Patent No. 6,197,108) and Sonoda (US Patent No. 5,911,823),

Iino 108 pertains to a method of manufacturing a monocrystalline silicon crystal via Czochralski method without performing a necking method such as the “Dash” comprising the steps of providing a seed crystal having a tip end with a sharp-pointed shape or a truncation thereof in which an angle of the tip is end is not less than  $3^{\circ}$  but not greater than  $28^{\circ}$ , whereby keeping the tip end of the seed crystal at just above a silicon melt to heat it before bringing the tip end of the seed crystal into contact with the silicon melt, and therefore subsequently bringing the tip end of the seed crystal into contact with the silicon melt and immersing the seed crystal into the silicon melt to a desired diameter, whereby in certain embodiments a shifting may occur. As well Iino 108 suggests that this method can be used with prescribed pulling rates and the use of MCZ method, which utilizes a magnet chamber system (See Abstract, Col 3 Lines 35-68, Col 4 Lines 1-14, 40-68, Col 7 Lines 28-54, Col 10 Lines 16-24, Col 14 Lines 54-63, and Col 18 Lines 22-30).

However Iino 108 fails to explicitly teach the temperature variation of the silicon melt and its particular gradient. Albeit that Iino 108 inherently teaches there would need be a temperature condition set forth to utilize the seed crystal in conjunction with the melt, the method does not go into detail about those matters nor the particular direction of the crystal orientation when grown.

In a method referring to pulling a single crystal semiconductor and method of making, Sonoda 823 teaches a similar method for a particular <110> single crystal silicon whereupon it takes into account that there be very little temperature variation within the silicon melt in order to prevent defects from occurring in the seed crystal immersed in the melt. This is of course accomplished with a slow pulling rate but also the application of a magnetic field utilizing the MCZ technique, whereby applying a field of 500 G or more, whereby the temperature variation depending on intensity can be reduced down to a 1.5-1<sup>0</sup> Celsius range (See Abstract, Col 2 Lines 1-68).

However the prior art failed to teach the specified rates of the pulling rate as claimed by applicant. Although they teach pulling rates such as Iino 108 and Sonada 823 using a 1.5 –2.0 mm/min rate, it does not break down to reducing the rate down to .5 mm/min as claimed by applicant. Nor does the prior art specifically address bringing the silicon crystal tip into a silicon melt that is 10-20 degrees Celsius higher than the tip temperature. In particular related to the fact that applicant's invention pertains to these steps occurring without "Dash Necking method". Prior art teaches it correlated to "Dash Necking method". Thus Examiner is inclined to agree with applicant that the case is now in condition for allowance.

3) Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to G. Nagesh Rao whose telephone number is (571) 272-2946. The examiner can normally be reached on 9AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yogendra Gupta can be reached on (571)272-1316. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
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GNR